Melrose Bridge
Spanning the Black River at State Trunk Highway 108
Town of Melrose
Jackson County
Wisconsin

HAER No. WI-71

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Denver, Colorado 80225-0287

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HISTORIC AMERICAN ENGINEERING RECORD
MELROSE BRIDGE

HAER No. WI-71

Location:	Spanning the Black River at State Trunk Highway 108 in the Town of Melrose, Jackson County, Wisconsin. State Trunk Highway (STH)108 is a north-south artery connecting the cities of La Crosse and Black River Falls.
UTM:	A (southwest end): 15:4885660:660370 B (northeast end): 15:4885850:660440
Quad:	Four Corners, Wisconsin (7.5-minute series)
Date of Construction:	1922
Designer and Builder:	Designed by the Wisconsin State Highway Commission. Fabricated by the Worden-Allen Company of Milwaukee, Wisconsin.
Present Owner:	None
Present Use:	Demolished in 1985
Significance:	Only six Pennsylvania highway trusses are known to have been built in Wisconsin. Four of the six, including the Melrose Bridge, have been replaced within the last 10 years. The Melrose Bridge is an example of a State Highway Commission design that was fabricated by a leading Wisconsin bridge building company, Worden-Allen.
Project Information:	The documentation of the Melrose Bridge was begun in 1984 by Robert S. Newbery, Wisconsin Department of Transportation Staff Historian, in accordance with the Memorandum of Agreement, and was completed in 1994 with the assistance of Amy A. Ross, Architectural Historian at Mead & Hunt, Inc.

HISTORICAL BACKGROUND

In February 1853, central Wisconsin's Jackson County was created from portions of La Crosse County by an act of the State Legislature. The Jackson County boundaries changed several times in the subsequent 30 years, as parcels were detached and annexed to adjacent counties. The last change occurred in March 1883, when a small, southern section became part of Monroe County and the county acquired its present form .[1]

Trappers who worked for the American Fur Company were the first whites to venture up the Black River and establish a trading post in what became Jackson County. At the time, about 1820, the Winnebago Indians claimed ownership of the land along the river. Shortly after the Winnebagoes ceded this land to the U.S. government in 1838, Robert and Andrew Wood led a group that established the first permanent white settlement near Black River Falls. Lumbering and wheat farming proved profitable for these early settlers.[2]

In 1852, Hugh Douglas was attracted by the natural features of a site along the Black River and suggested that a village be established there. Two years later, the village of Melrose was surveyed and platted. Charles Chafey erected a grist mill in 1855, which was one of Melrose's first businesses. A post office, hotel, and general store opened in the 1850s. At the turn of the century, Melrose experienced a building boom.[3] The 1901-02 Wisconsin State Gazetteer lists a planing mill, two feed mills, and a creamery among the new businesses in Melrose, which then

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[1] Origins and Legislative History of County Boundaries in Wisconsin (Madison, Wisc.: Wisconsin Historic Records Survey, 1942).

[2] Jackson County: A History (Dallas, Texas: Taylor Publishing Co., 1984) 5-7.

[3] Jackson County 19.

had a population of 250.[4] Ten years later, Melrose housed a bank, high school, and grade school as well.[5] The village was incorporated in 1913, and its population peaked at about 600 in the 1920s.[6]

HISTORY OF THE CROSSING

On July 4, 1852, Robert and Thomas Douglas launched the first ferry across the Black River from a site south of Melrose. In 1896, the ferry, then owned by E. Gaylord, was the last in operation on the Black River. The construction of a bridge at Melrose had been discussed as early as 1863. However, the first bridge at this site, a combination steel truss and timber trestle, was not erected until 1896. The structure was built by the Clinton Bridge Company for $7,300.[7]

This structure was described as consisting of two 150-foot and one 77-foot steel trusses and a 230-foot timber trestle.[8] With a total length of 600', the bridge spanned a 200-foot-wide main channel and a shallow, 100-foot secondary channel. The bridge had a 16-foot roadway and steel tube substructure. By 1920, the bridge was no longer adequate. A public hearing was held on September 28, 1920, to discuss replacing the bridge. Local residents attending expressed several concerns about the old bridge: steam tractors had difficulty crossing due to the bridge's narrow width, one or two more floods would likely take it out, repair costs would be too high, and it could not withstand a heavy load.

The surveyor, Martin W. Torkelson, recommended two 150-foot and four 75-foot steel truss spans, a roadway width of 20', and a concrete substructure for the new bridge. He also advocated using 40-foot wood piles under the abutments, because the banks were unstable. The

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[4] Wisconsin State Gazetteer and Business Directory, 1901-02 (Chicago: R.L. Polk & Co., [1901]).

[5] Wisconsin State Gazetteer and Business Directory, 1911-12 (Chicago: R.L. Polk & Co., [1911]).

[6] Jackson County 19.

[7] "New Bridge at Melrose...," The Banner Journal 18 September 1985: 3. This article is based on a survey of a century's worth of coverage of the bridge in local newspapers. For information on the ferry, it relied on A.D. Polley's "Stories of Pioneer Days in the Black River Valley." See also "Melrose Bridge Dedication," 29 September 1985 (copy on file at Wisconsin Department of Transportation), which seems to rely on the same sources.

[8] At the request of the County Bridge Committee, the original Melrose Bridge was inspected on June 24, 1920, in preparation for the construction of a new one. This description is based on the inspection report.

survey report estimated that the new bridge would cost $71,150.[9] However, the actual cost was just over half this original estimate. The discrepancy may be due to the fact that a single 200-foot main span and six pony truss approach spans were selected for the final design, rather than the two 150-foot and four 75-foot trusses originally recommended.

Final plans were completed by the Wisconsin State Highway Commission (SHC) on November 23, 1921. The Worden-Allen Company of Milwaukee, with the lowest of 15 bids submitted, was awarded the contract in late December 1921. The Melrose Bridge was finished in November 1922 and the old bridge was taken down the following winter.[10]

In 1977, the Lunda Construction Company of Black River Falls completed repairs totalling $29,000 on the Melrose Bridge. In 1983, the Wisconsin Department of Transportation decided to replace the narrow steel bridge with a 7-span, 670-foot-long, 40-foot-wide concrete structure. The $1.5 million contract for the new bridge was awarded to the Lunda Construction Company. On September 19, 1985, this structure was opened to traffic.[11]

ENGINEERING DESCRIPTION

The Melrose Bridge consisted of a 200-foot, 12-panel Pennsylvania truss main span and six Warren pony truss approach spans, each approximately 78' long. The overall length was 667' and overall width 20'. The roadway width was 19', with no sidewalks or shoulders. Vertical clearance was 14'-2".[12]

The inclined end-post and upper chord of the Pennsylvania truss span consisted of 12-inch double-upright channels with an 18-inch cover plate and X-lacing. The lower chord was comprised of two pairs of riveted back-to-back angles. Vertical members of the bridge were

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[9] "Bridge Survey Report," Wisconsin Highway Commission (files of the Wisconsin Department of Transportation). Fieldwork was conducted on June 24, 1920 by W.W. Torkelson. The preliminary estimate was mad on August 23, 1921 and the final estimate for the new bridge was signed with the initials, C.H.K., on December 1, 1921.

[10] Minutes of the County Board of Supervisors, 19 October 1922, Jackson County, Wisconsin. Ed Stetzer had the honor of being the first local resident to drive across the 1922 bridge in his horse and buggy; see "New Bridge at Melrose" 3. The village and township received refunds from the county because the bridge cost less than anticipated; see Board of Supervisors, Jackson County, Official Proceedings, 1922 (N.p.: published by the Board, [1922]).

[11] "Melrose Bridge Dedication."

[12] George M. Danko, "A Selective Survey of Metal Truss Bridges in Wisconsin," ms., State Historical Society of Wisconsin, 1977.

formed from two channel beams riveted together with X-lacing. The diagonal members were paired angles tied together with batten plates. Intermediate laterals, which were found in panels 3, 5, 6, 7, 8 and 10, were the unique members that made this a Pennsylvania truss. These laterals comprised double channels connected with X-lacing. All of the steel members had riveted connections.

The floor system of the main span was composed of rolled I-beams riveted to gusset plates at panel points, rolled I-beam stringers, and a poured concrete deck. The substructure consisted of concrete abutments and piers. The south abutment rested on a fixed shoe bearing, while a roller was used on the north end.

The six Warren trusses at the north end of the Melrose Bridge are typical of the era. This style of truss was used exclusively by the SHC after 1914 for low-truss bridges. In 1914, the SHC developed a set of plans for low Warren trusses for bridges ranging from 35' to 85' in length. The inclined endposts and top chords of the Warren spans comprised double-upright channels tied with batten plates and a cover plate. The vertical members were formed from back-to-back angles riveted together with V-lacing. The diagonal members were paired angles.

The two truss designs that came to dominate highway bridge construction by the late 19th century were the Warren and the Pratt. The Warren truss was patented by two British engineers in 1840. In this design, the vertical members handle only nominal stress, while the diagonals serve as both tension and compression members.[13] The Pratt truss, patented by Caleb and Thomas Pratt in 1844, features vertical compression and diagonal tension members. Although originally built as a combination bridge, the Pratt truss was not as efficient in that form as the Howe. As an all-metal bridge, however, the Pratt had the advantage because it used less iron and was easier to erect. The oldest existing truss bridge in Wisconsin, the 1877 White River Bridge in Burlington, is a Pratt.[14]

During the 1870s, an important variation of the Pratt design was introduced for long-span bridges. Because the depth of truss required in the center of a bridge is greater than at the abutments, a considerable amount of material can be saved on a long-span structure by "bending" the top chord into a polygonal configuration known as a "Parker" truss. If the top chord has

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[13] T. Allan Comp and Donald Jackson, "Bridge Truss Types: A Guide to Dating and Identifying," American Association for State and Local History, Technical Leaflet 95, History News 32.5 (1977); Working Files, Historic Bridge Advisory Committee (HBAC), Wisconsin Department of Transportation, 1981. A more detailed discussion on the general history of trusses can be found in HAER No. WI-57 and HAER No. WI-63.

[14] Comp and Jackson. A few all metal Howe trusses were built, including, apparently, one built in Watertown in 1875; see Diane Kromm, "Milford Bridge," Historic American Engineering Record Report, (HAER No. WI-21, 1987) 2.

exactly five sides, the bridge, by convention, is called a "camelback" truss. The addition of substruts and/or subties makes a Pratt into a Baltimore and a Parker into a Pennsylvania.[15]

The Pennsylvania truss was a "major advance in strengthening the Pratt truss," a type that had become one of the two predominant truss types in the United States in the late 19th century. The Pennsylvania truss's distinctive features included an inclined top chord for economy of material and panel subties or substruts for greater strength. These features were a response to the increasing live loads of railroad locomotives and rolling stock. The Pennsylvania truss—its name derived from extensive use on the Pennsylvania railroad—is generally found in the United States with lengths of 250' to 600'.[16] None of Wisconsin's Pennsylvania trusses were of such length, however, and the 231-foot trusses of the Bridgeport Bridge, which span the Wisconsin River between the counties of Grant and Crawford, were among the longest known to have been built in the state. The SHC promoted using the Warren pony and Pratt overhead trusses.

Only six Pennsylvania highway trusses are known to have been built in Wisconsin. Four of the six, including the Melrose Bridge, have been replaced. The Hemlock Bridge was on Warner Drive over the Black River in Clark County and was a 3-span structure with a total length of 248'. Its main span was a 200-foot Pennsylvania truss, an example of the work of Wausau Iron Works. The Bridgeport Bridge was built between 1930–31 following plans prepared by the SHC and crosses the Wisconsin River nears its confluence with the Mississippi. This bridge consisted of seven Pennsylvania trusses, all approximately 231' long, and three short steel-beam approach spans. The Radke Bridge over the Kickapoo River, built in 1925, was replaced in 1980. This 200-foot Pennsylvania truss was a joint effort of the Illinois Steel Bridge Company and the Minneapolis Bridge Company.

The two extant examples include the Lynch Bridge, which was completed in 1940 and is a late example of a Pennsylvania truss designed by a private bridge company, Wausau Iron Works. Its relatively light construction and narrow roadway are more reminiscent of earlier long-span overhead-truss bridges. This bridge, which was moved to private property in 1991, has a 200-foot span. The other surviving Pennsylvania truss in Wisconsin is the Cobban Bridge

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[15] Comp and Jackson.

[16] American Association for State and Local History Technical Leaflet 95, History News, Vol. 32, No. 5, May 1977; T. Allen Comp and Donald Jackson, "Bridge Truss Types: A Guide to Dating and Identifying," pp. 5-7. See also J.A.L. Waddell, Bridge Engineering (1916; New York: J. Wiley & Sons, Inc., 1921) 25, 268, 469 and 478; J.A.L. Waddell, Economics of Bridgework (New York: J. Wiley & Sons, Inc., 1921) 176-77; J.B. Johnson, C.W. Bryan, and F.E. Turneaure, The Theory and Practice of Modern Framed Structures (New York: J. Wiley & Sons, Inc., 1905) 212; Henry G. Tyrrell, History of Bridge Engineering (Chicago: published by the author, 1911) 184-92.

currently located over the Chippewa River. Built in 1908, this bridge originally spanned the Yellow River but was moved to its present location in 1917. The Cobban Bridge consists of two 241-foot spans fabricated by the Modern Steel Structural Company of Waukesha, Wisconsin.[17]

WORDEN-ALLEN COMPANY

The Worden-Allen Company was awarded a contract of $44,987 to construct the Melrose Bridge in December 1921. Founded by Beverly Lyon Worden and Clarence J. Allen, Worden-Allen was incorporated in Wisconsin in December 1902. One of the largest 20th-century bridge companies in the Midwest, the firm had offices in Chicago and Michigan. In addition, Worden-Allen controlled the Lackawanna Bridge Company of New York. In 1911, the firm could boast a structural steel capacity of 12,000 to 15,000 tons per annum and a yearly business of one million dollars.[18]

Born in Chicago in 1871, Worden worked in the Milwaukee Public Library before becoming an engineer. Presumably, he was an apprentice engineer at the Wisconsin Bridge and Iron Company while pursuing a degree in civil engineering from the University of Wisconsin. After receiving his degree in 1893, he advertised as a civil engineer. In 1895, Worden was listed as a bridge engineer in the city directory. From 1896 to 1902, he was listed as a contracting or construction engineer. These terms may refer to a superintendent position he held with Wisconsin Bridge and Iron. Worden appears to have contributed more to the firm than Allen, who was associated with the company only from the company's founding until 1907, serving as secretary-treasurer. The name remained Worden-Allen and it was Beverly Worden who achieved prominence in the field.

Worden-Allen built a number of Warren pony trusses based on the standardized plans of the SHC. The company was also responsible for the first known riveted Pratt overhead truss in Wisconsin, built in 1909. By 1915, Worden-Allen had diversified and advertised as a manufacturer of "all kinds of structural steel work." The firm continued to build bridges in Wisconsin at least until 1933. The company was dissolved on December 30, 1977.[19]

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[17] Working Files, HBAC.

[18] Danko 55. For this information, Danko drew from Greater Milwaukee: Financial, Commercial and Biographical (Milwaukee: The Journal Company, 1911); Milo S. Ketchum The Design of Highway Bridges (New York: Engineering News Publishing Co., 1908); and Poor's Manual of Industrials (New York: Poor's Railroad Manual Company, 1911).

[19] Robert S. Newbery, "Metal Truss Bridges in Wisconsin" (Madison, Wisc.: Wisconsin Department of Transportation, forthcoming).

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Fig. 1

USGS Quad: Four Corners, Wisconsin (7.5 minute series)
A (southwest end): 15:4885660:660370
B (northeast end): 15:4885850:660440